CLAIMS

1. A method for the manufacture of bisphenols comprising:

introducing a combined feed stream comprising a feed stream and a recycle stream into a reactor system comprising at least one reactor containing a catalytic proportion of an acid catalyst and wherein the combined feed stream comprises a carbonyl compound and an amount of greater than or equal to about 60 wt% phenol, based on the total weight of the combined feed stream;

removing from the reactor system a reactor effluent;

splitting the reactor effluent into a crystallization feed stream and an effluent recycle stream;

extracting from said crystallization feed stream a bisphenol adduct, remainder comprising a mother liquor stream;

dehydrating said mother liquor stream and said effluent recycle stream in a dehydrator wherein excess water and carbonyl compound are removed; and

recycling the dehydrated mother liquor and the dehydrated effluent recycle stream back to the combined feed stream to effect improved production of p,p-bisphenol, along with increased reactor selectivity and reduced promoter quantities.

2. The method of claim 1, wherein the phenol is an ortho-cresol, meta-cresol, 2,6-dimethylphenol, ortho-sec-butylphenol, 1,3,5 xylenol, tetramethylphenol, 2-methyl-6-tert. butylphenol, orthophenylphenol, ortho- and meta-chlorophenol, ortho-bromophenol, 2,6-dichlorophenol, or a combination comprising at least one of the foregoing phenols.

3. The method of claim 1, wherein the carbonyl compound is acetone, methyl ethyl ketone, methyl propylketone, methyl vinyl acetone, acetophenone and cyclohexanone, or a combination comprising at least one of the foregoing ketones.

4. The method of claim 1, wherein the carbonyl compound is acetone.

5. The method of claim 1, wherein the ratio of carbonyl compound to phenol is about 1:2 to about 1:40.

6. The method of claim 1, wherein the effluent recycle stream comprises about 6 to about 22 wt% of reactor effluent.

7. The method of claim 1, wherein carbonyl compound concentration in the combined feed stream is about 1 to about 8 wt% of the total weight of the combined feed stream.

8. The method of claim 1, wherein phenol concentration in the combined feed stream is less than or equal to about 85 wt% of the total weight of the combined feed stream.

9. The method of claim 1, wherein phenol concentration in the combined feed stream is about 65 to about 80 wt% of the total weight of the combined feed stream.

10. The method of claim 1, wherein p,p-bisphenol concentration in the combined feed stream is about 5 to about 20 wt% of the total weight of the combined feed stream.

11. The method of claim 1, wherein p,p-bisphenol concentration in the combined feed stream is about 7 to about 18 wt% of the total weight of the combined feed stream.

12. The method of claim 1, wherein p,p-bisphenol concentration in the combined feed stream is about 10 to about 16 wt% of the total weight of the combined feed stream.

13. The method of claim 1, wherein the catalyst is a sulfonated polystyrene, poly(styrenedivinylbenzene) copolymers, sulfonated phenolformaldehyde resins, or a combination comprising at least one of the foregoing catalysts.

14. The method of claim 1, wherein the catalyst is an acidic form of sulfonated polystyrene cross-linked with divinylbenzene having an activity of 1.0 and capable of handling a total hydraulic flow of 150 m^3/hour.

15. The method of claim 14 wherein the catalyst comprises pendant sulfonic acid groups having about 2 to about 4% divinyl benzene crosslinking.

16. The method of claim 1, wherein the promotor is a methyl mercaptan, ethyl mercaptan, propyl mercaptan, 3-mercaptopropionic acid, or a combination comprising at least one of the foregoing promotors.

17. The method of claim 1, wherein the promotor is 3-mercapto propionic acid.

18. The method of claim 13, wherein the promotor is present in an amount of about 500 to about 10,000 ppm with respect to the total weight of the combined feed stream.

19. A method for the preparation of bisphenols comprising:

reacting acetone with an excess of phenol in a reactor containing a catalyst bed comprising an acidic form of sulfonated polystyrene cross-linked with divinylbenzene having an activity of 1.0, treated with 3-methyl propionic promotor;

splitting the reactor effluent into a crystallization feed stream and an effluent recycle stream, wherein the effluent recycle stream comprises about 6 to about 22 wt% of the reactor effluent;

extracting from the crystallization feed stream a bisphenol adduct to leave behind a mother liquor;

dehydrating the mother liquor and the effluent recycle stream to produce a recycle stream;

combining the recycle stream with a new feed stream to produce a combined feed stream wherein the combination of the recycle stream and feed stream results in an improved production of p, p-bisphenol or reduced levels of promotor.

20. A method of claim 19, wherein the reactor inlet temperature is about 45°C to about 60°C.

21. A method of claim 19, wherein the p,p-bisphenol concentration in the combined feed stream is about 5 to about 20 wt% of the total weight of the combined feed.

22. A method of claim 19, wherein the acetone concentration in the combined feed stream is about 1 to about 8 wt% of the total weight of the combined feed.

23. The method of claim 19, wherein the phenol is an ortho-cresol, meta-cresol, 2,6-dimethylphenol, ortho-sec-butylphenol, 1,3,5 xylenol, tetramethylphenol, 2-methyl-6-tert. butylphenol, orthophenylphenol, ortho- and meta-chlorophenol, ortho-bromophenol, 2,6-dichlorophenol, or a combination comprising at least one of the foregoing phenols.

24. The method of claim 19, wherein the recycle stream emanating from the dehydrator comprises about 70 to about 80 wt% phenol, about 0.1 to about 0.3 wt% water, about 0.1 to about 1 wt% carbonyl compound, about 8 to about 15 wt% p,p-bisphenol, about 3 to about 4 wt% o,p-bisphenol, about 0.5 to about 1.5 wt% chromane, and about 1 to 1.5 wt% dimers.

25. A method for the preparation of bisphenols comprising:

reacting acetone with an excess of phenol in a reactor containing a catalyst bed comprising an acidic form of sulfonated polystyrene cross-linked with divinylbenzene having an activity of 1.0, treated with 3-methyl propionic promotor;

splitting the reactor effluent into a crystallization feed stream and an effluent recycle stream, wherein the effluent recycle stream comprises about 6 to about 22 wt% of the reactor effluent;

extracting from the crystallization feed stream a bisphenol adduct to leave behind a mother liquor;

dehydrating the mother liquor and the effluent recycle stream to produce a recycle stream;

combining the recycle stream with a new feed stream to produce a combined feed stream wherein the combined feed stream comprises about 60 to about 85 wt% phenol, about 0.01 to about 3 wt% water, about 5 to about 20 wt% p,p-bisphenol.

26. The method of Claim 25, wherein the carbonyl concentration in the feed stream is reduced by an amount of greater than or equal to about 15 wt% when compared with a process where the reactor effluent is not recycled.

27. The method of Claim 25, wherein the promotor concentration is reduced by an amount of greater than or equal to about 10 wt% when compared with a process where the reactor effluent is not recycled.